

**COUPLING OF SPLITTER WITH SUBSET OF  
PLURALITY OF LINES ON ONE-TO-ONE BASIS**

**CROSS-REFERENCE TO RELATED APPLICATIONS**

This application contains subject matter which is related to the subject matter of the  
5 following applications, which are assigned to the same assignee as this application. The  
below-listed applications are hereby incorporated herein by reference in their entireties:

“TELECOMMUNICATION EQUIPMENT SUPPORT OF HIGH SPEED DATA  
SERVICES,” by Nye et al., Serial Number 08/767,138, filed December 19, 1996.

“A DSL-COMPATIBLE POTS LINE CARD,” by Nordin et al., Serial Number  
10 09/617,446, filed July 17, 2000.

“DIRECT ELECTRICAL CONNECTABILITY OF PORT OF SPLITTER UNIT TO  
CONNECTOR OF INTERFACE CIRCUIT OF SWITCH,” by Foss et al., Serial Number  
, filed concurrently herewith.

**TECHNICAL FIELD**

15 The invention in one embodiment relates generally to telecommunications and more  
particularly to employment of a splitter at a central office for use with a digital subscriber  
loop/line (“DSL”).

**BACKGROUND**

A splitter in one example comprises a plain old telephone service (“POTS”) splitter.  
20 A POTS splitter in one example comprises a low-pass filter and a high-pass filter. The low-  
pass filter in one example serves to direct analog voice signals to a first line. The high-pass

filter in one example serves to direct a digital subscriber line ("DSL") signal to a second line. In one example, each line comprises a twisted wire pair.

One implementation employs external splitters. External splitters in one example comprise a separate shelf within a cabinet. As one shortcoming, the separate shelf consumes  
5 space within the cabinet. As another shortcoming, the separate shelf requires the telephone company to run lines for all the splitters to provide DSL service to any one or more customers among all the customers served by the splitters of the splitter shelf.

At a central office, in one example, the telephone company runs lines from the main distribution frame to the splitter shelf. In addition, the telephone company runs lines from the  
10 splitter shelf to a digital subscriber line access multiplexor ("DSLAM"), for example, to provide asymmetric digital subscriber line ("ADSL") service. Further, the telephone company runs lines from the splitter shelf to a switch, for instance, a Class 5 switch, for example, to provide POTS. The running of all these lines involves a disadvantageously large use of resources, time, and space.

15 An implementation that had previously employed POTS only, undesirably rewires lines to all splitters of the splitter shelf, even to update only a single line to provide asymmetric digital subscriber line service in addition to the POTS. For example, the implementation requires wiring for a new bay of equipment that services all the splitters of the splitter shelf.

20 Thus, a need exists for enhanced selectivity in coupling of a splitter with a number of lines. A further need exists for an enhanced basis in coupling of a splitter with a number of lines.

## SUMMARY

Pursuant to one embodiment of the invention, shortcomings of the existing art are overcome and additional advantages are provided through the provision of coupling of a splitter with a subset of a plurality of lines on a one-to-one basis.

5        The invention in one embodiment encompasses a system. The system includes a splitter that is locatable at a central office that comprises a plurality of lines. The splitter is configured to be connectable with a subset of the plurality of lines on a one-to-one basis between the splitter and the subset of the plurality of lines.

10       Another embodiment of the invention encompasses a method. A splitter that is locatable at a central office that comprises a plurality of lines is selected. The splitter is selected to be configured to be connectable with a subset of the plurality of lines on a one-to-one basis between the splitter and the subset of the plurality of lines.

15       These and other features and advantages of one embodiment of the invention will become apparent from the following detailed description, the accompanying drawings, and the claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates one example of a system that includes one or more networks, an outside plant, and a central office that includes one or more splitters, a main distribution frame, and one or more interface circuits.

20       FIG. 2 represents illustrative details of one example of a splitter of the system of FIG. 1.

FIG. 3 represents illustrative details of another example of a splitter of the system of FIG. 1.

### DETAILED DESCRIPTION

In one embodiment of the invention, a splitter is coupled with a subset of a plurality of lines at a central office on a one-to-one basis between the splitter and the subset of the plurality of lines. A detailed discussion of one exemplary embodiment of the invention is presented herein, for illustrative purposes.

Turning to FIG. 1, system 100, in one example, includes a plurality of components such as computer hardware components. A number of such components can be combined or divided in one example of system 100.

Referring again to FIG. 1, system 100 in one example comprises one or more components, for example, components 104 and 106, networks 108 and 110, a plurality of instances of line 114, and facilities 130 and 132.

Still referring to FIG. 1, line 114 in one example serves to connect and/or couple one or more components of system 100 with one or more other components of system 100. In one example, line 114 comprises wires 116 and 118. For example, wires 116 and 118 each comprise solid wire such as twenty-two to twenty-six gauge solid wire. Wire 116 in one example comprises a tip ("T") wire. Wire 118 in one example comprises a ring ("R") wire. Wires 116 and 118 in one example comprise twisted wire pair 120, as will be appreciated by those skilled in the art. Exemplary instances of line 114 comprise lines 122, 124, 126, and 128. Exemplary instances of facilities 130 and 132 comprise interoffice facilities, for

example, E3, DS3, E1, DS1, STM-1, and OC3, as will be understood by those skilled in the art.

Referring further to FIG. 1, line 122 in one example serves to couple component 104 with component 106. Facility 130 in one example serves to couple component 104 with  
5 network 108. Facility 132 in one example serves to couple component 104 with network 110.

Referring still to FIG. 1, component 104 in one example comprises central office ("CO") 112. Central office 112 in one example comprises a local telephone company switching center and/or a telecommunications central office. For example, central office 112 comprises an end office, for instance, a Class 5 office. In one example, central office 112  
10 connects directly to component 106. In a further example, central office 112 provides customer services such as call waiting and call forwarding. In a still further example, central office 112 performs billing, as will be appreciated by those skilled in the art.

Again referring to FIG. 1, central office 112 in one example comprises splitter 134, main distribution frame ("MDF") 136, switch 138, and multiplexor 140. Line 122 in one  
15 example serves to couple component 106 with main distribution frame 136. Line 124 in one example serves to couple main distribution frame 136 with splitter 134. Line 126 in one example serves to couple splitter 134 with switch 138. Line 128 in one example serves to couple splitter 134 with multiplexor 140. Facility 130 in one example serves to couple switch 138 with network 108. Facility 132 in one example serves to couple multiplexor 140 with  
20 network 110.

Still referring to FIG. 1, splitter 134 in one example is advantageously compatible with standard and/or known wiring for POTS, and desirably allows an addition of DSL service.

Referring to FIGS. 1-2, splitter 134 and lines 124, 126, and 128 in one example comprise individual unit 188 in central office 112. In one example, lines 124, 126, and 128 comprise subset 190 of a plurality of instances of line 114 of system 100. For example, splitter 134 is connectable with subset 190 of a plurality of instances of line 114 on a one-to-one basis between splitter 134 and subset 190. Splitter 134 in one example is configured to be connectable with subset 190 of a plurality of instances of line 114 on a one-to-one basis between splitter 134 and subset 190. In a further example, an instance of line 114 of subset 190 is advantageously convertible from a POTS line (e.g., line 126) to a POTS and asymmetric digital subscriber line (e.g., line 124) on a basis of individual unit 188 that comprises splitter 134 and subset 190. Desirably, splitter 134 in one example is installable on subset 190 of a plurality of instances of line 114 without interruption of POTS on a particular instance of line 114 (e.g., line 192) that is different from every instance of line 114 of subset 190. Advantageously, splitter 134 in one example is connectable with lines 124, 126, and 128 without employment of a splitter shelf.

Referring to FIGS. 1 and 3, splitter 134 and lines 124 and 126 in one example comprise individual unit 188 in central office 112. In one example, lines 124 and 126 comprise subset 190 of a plurality of instances of line 114 of system 100. For example, splitter 134 is connectable with subset 190 of a plurality of instances of line 114 on a one-to-one basis between splitter 134 and subset 190. In a further example, an instance of line 114 of subset 190 is advantageously convertible from a POTS line (e.g., line 126) to a POTS and asymmetric digital subscriber line (e.g., line 124) on a basis of individual unit 188 that comprises splitter 134 and subset 190. Desirably, splitter 134 in one example is installable on subset 190 of a plurality of instances of line 114 without interruption of POTS

on a particular instance of line 114 (e.g., line 192) that is different from every instance of line 114 of subset 190. Advantageously, splitter 134 in one example is connectable with lines 124 and 126 without employment of a splitter shelf.

Referring again to FIG. 1, main distribution frame 136 in one example comprises a  
5 connecting unit between instances of line 114 that relative to central office 112 are external, and instances of line 114 that relative to central office 112 are internal. For example, main distribution frame 136 comprises a connecting unit between an instance of line 122 that is external relative to central office 112, and an instance of line 124 that is internal relative to central office 112. In one example, main distribution frame 136 comprises protector 142.  
10 Protector 142 in one example serves to protect central office 112 from possible damage that otherwise could result, for example, from foreign over-voltage and/or over-current introduced in outside plant 160 on one or more instances of line 114.

Referring still to FIG. 1, switch 138 in one example comprises Class 5 switch 144.  
For example, switch 138 comprises circuit 146. Circuit 146 in one example comprises POTS  
15 interface circuit 148.

Further referring to FIG. 1, multiplexor 140 in one example comprises a digital subscriber line multiplexor, for example, digital subscriber line add/drop multiplexor ("DSLAM") 150. Digital subscriber line add/drop multiplexor 150 in one example comprises circuit 152. Circuit 152 in one example comprises asymmetric digital subscriber line  
20 ("ADSL") interface circuit 154.

Again referring to FIG. 1, network 108 in one example comprises public switched telephone network ("PSTN") 156. Public switched telephone network 156 in one example

comprises the worldwide voice telephone network, as will be understood by those skilled in the art.

Referring still to FIG. 1, network 110 in one example comprises asynchronous transfer mode ("ATM") network 158. Asynchronous transfer mode network 158 in one example supports realtime voice, video, and data.

Again referring to FIG. 1, component 106 in one example comprises outside plant 160. Outside plant 160 in one example comprises a feeder and distribution system, for example, to a number of instances of home 162 and/or office 164 of one or more instances of customer 165 of central office 112.

Turning to FIG. 2, splitter 134 in one example comprises filters 202 and 204, wires 206, 208, 210, 212, 236, and 244, and connectors 214, 216, 218, 220, 222, and 224. Filters 202 and 204 in one example each comprise a low-pass filter. For example, filters 202 and 204 each comprise a 4 kHz low-pass filter.

Referring again to FIG. 2, wire 230 in one example serves to couple connector 222 with connector 214. Wire 232 in one example serves to couple connector 222 with filter 202. Wire 236 in one example serves to couple filter 202 with connector 218. Wire 210 in one example serves to couple connector 224 with connector 216. Wire 212 in one example serves to couple connector 224 with filter 204. Wire 244 in one example serves to couple filter 204 with connector 220.

Now referring to FIGS. 1-2, line 124 in one example comprises POTS and asymmetric digital subscriber line 166. POTS and asymmetric digital subscriber line 166 in one example comprises wires 168 and 170. Wire 168 in one example comprises a tip wire. Wire 170 in one example comprises a ring wire. In a further example, wire 168 comprises wire wrap



terminal 172 of main distribution frame 136. Wire wrap terminal 172 in one example comprises a tip wire wrap terminal. In a still further example, wire 170 comprises wire wrap terminal 174 of main distribution frame 136. Wire wrap terminal 174 in one example comprises a ring wire wrap terminal, as will be appreciated by those skilled in the art.

5 Referring still to FIGS. 1-2, connectors 214, 216, 218, and 220 in one example comprise respective instances of insulation displacement connectors ("IDC") type terminals. Connectors 222 and 224 in one example comprise sockets 226 and 228, respectively, as will be appreciated by those skilled in the art.

10 Referring again to FIGS. 1-2, socket 226. Socket 226 in one example comprises a tip socket. In one example, socket 226 is coupled with wire 168. For instance, socket 226 telescopically engages wire wrap terminal 172. For example, socket 226 is mounted on and/or plugged onto wire wrap terminal 172. Socket 228 in one example comprises a ring socket. In one example, connector 224 is coupled with wire 170. For instance, socket 228 telescopically engages wire wrap terminal 174. For example, socket 228 is mounted on and/or plugged onto wire wrap terminal 174.

15 Referring further to FIGS. 1-2, outside plant 160 in one example sends signal 173 across line 122 to central office 112. For example, outside plant 160 sends signal 173 across line 122 to main distribution frame 136. Signal 173 in one example comprises POTS and asymmetric digital subscriber line signal 175. Main distribution frame 136 in one example employs POTS and asymmetric digital subscriber line signal 175 to obtain signal 176.

20 Still referring to FIGS. 1-2, main distribution frame 136 in one example sends signal 176 across line 124 to splitter 134. Signal 176 in one example comprises POTS and asymmetric digital subscriber line signal 178. Splitter 134 in one example employs POTS and

asymmetric digital subscriber line signal 178 to obtain POTS signal 180 and POTS and asymmetric digital subscriber line signal 182, as described herein.

Again referring to FIGS. 1-2, connector 222 of splitter 134 in one example employs POTS and asymmetric digital subscriber line signal 178 to obtain and send POTS and asymmetric digital subscriber line signal 230 across wire 206 to connector 214. In a further example, connector 222 employs POTS and asymmetric digital subscriber line signal 178 to obtain and send POTS and asymmetric digital subscriber line signal 232 across wire 208 to filter 202. Filter 202 in one example employs POTS and asymmetric digital subscriber line signal 232 to obtain and send POTS signal 234 across wire 236 to connector 218.

Referring further to FIGS. 1-2, connector 224 of splitter 134 in one example employs POTS and asymmetric digital subscriber line signal 178 to obtain and send POTS and asymmetric digital subscriber line signal 238 across wire 210 to connector 216. In a further example, connector 224 employs POTS and asymmetric digital subscriber line signal 178 to obtain and send POTS and asymmetric digital subscriber line signal 240 across wire 212 to filter 204. Filter 204 in one example employs POTS and asymmetric digital subscriber line signal 240 to obtain and send POTS signal 242 across wire 244 to connector 220.

Referring still to FIGS. 1-2, connectors 218 and 220 of splitter 134 in one example employ signals 234 and 242 to obtain and send POTS signal 180 across line 126 to switch 138. Connectors 214 and 216 in one example employs signals 230 and 238 to obtain and send POTS and asymmetric digital subscriber line signal 182 across line 128 to multiplexor 140.

Further referring to FIGS. 1-2, splitter 134 in one example sends POTS signal 180 across line 126 to POTS interface circuit 148. POTS interface circuit 148 in one example

employs POTS signal 180 to obtain and send POTS signal 184 across facility 130 to public switched telephone network 156.

Again referring to FIGS. 1-2, splitter 134 in one example sends POTS and asymmetric digital subscriber line signal 182 across line 128 to asymmetric digital subscriber line interface circuit 154. Asymmetric digital subscriber line interface circuit 154 in one example employs POTS and asymmetric digital subscriber line signal 182 to obtain and send asynchronous transfer mode signal 186 across facility 132 to asynchronous transfer mode network 158.

Turning to FIG. 3, in another example, splitter 134 comprises filters 202 and 204, wires 208, 212, 236, and 244, and connectors 218, 220, 222, and 224. In a further example, line 128 serves to couple main distribution frame 136 with multiplexor 140. For example, line 128 serves to couple main distribution frame 136 with asymmetric digital subscriber line interface circuit 154.

Still referring to FIG. 3, splitter 134 in one example comprises an in-line instance of filter 134. In one example, splitter 134 is located near main distribution frame 136. In another example, splitter 134 is located a distance away from main distribution frame 136. For example, a location of splitter 134 depends on one or more factors such as availability of space.

Again further to FIG. 3, outside plant 160 in one example sends signal 173 across line 122 to central office 112. For example, outside plant 160 sends signal 173 across line 122 to main distribution frame 136. Signal 173 in one example comprises POTS and asymmetric digital subscriber line signal 175. Main distribution frame 136 in one example employs POTS and asymmetric digital subscriber line signal 175 to obtain signals 176 and 302. Signal 176 in

one example comprises POTS and asymmetric digital subscriber line signal 178. Signal 302 in one example comprises POTS and asymmetric digital subscriber line signal 182.

Still referring to FIG. 3, main distribution frame 136 in one example sends POTS and asymmetric digital subscriber line signal 178 across line 124 to splitter 134. Splitter 134 in one example employs POTS and asymmetric digital subscriber line signal 178 to obtain POTS signal 180.

Further referring to FIG. 3, in a further example, main distribution frame 136 sends POTS and asymmetric digital subscriber line signal 182 across line 128 to multiplexor 140. For example, main distribution frame 136 sends POTS and asymmetric digital subscriber line signal 182 across line 128 to asymmetric digital subscriber line interface circuit 154. Asymmetric digital subscriber line interface circuit 154 in one example employs POTS and asymmetric digital subscriber line signal 182 to obtain and send asynchronous transfer mode signal 186 across facility 132 (FIG. 1) to asynchronous transfer mode network 158 (FIG. 1).

Again referring to FIG. 3, connector 222 of splitter 134 in one example employs POTS and asymmetric digital subscriber line signal 178 from main distribution frame 136 to obtain and send POTS and asymmetric digital subscriber line signal 232 across wire 208 to filter 202. Filter 202 in one example employs POTS and asymmetric digital subscriber line signal 232 to obtain and send POTS signal 234 across wire 236 to connector 218.

Referring further to FIG. 3, connector 224 of splitter 134 in one example employs POTS and asymmetric digital subscriber line signal 178 to obtain and send POTS and asymmetric digital subscriber line signal 240 across wire 212 to filter 204. Filter 204 in one example employs POTS and asymmetric digital subscriber line signal 240 to obtain and send POTS signal 242 across wire 244 to connector 220.

Referring still to FIG. 3, connectors 218 and 220 of splitter 134 in one example employs signals 234 and 242 to obtain and send POTS signal 180 across line 126 to switch 138. For example, splitter 134 sends POTS signal 180 across line 126 to POTS interface circuit 148. POTS interface circuit 148 in one example employs POTS signal 180 to obtain  
5 and send POTS signal 184 (FIG. 1) across facility 130 (FIG. 1) to public switched telephone network 156 (FIG. 1).

The flow diagrams depicted herein are just exemplary. There may be many variations to these diagrams or the steps or operations described therein without departing from the spirit of the invention. For instance, the steps may be performed in a differing order, or steps may  
10 be added, deleted, or modified.

Although exemplary embodiments of the invention have been depicted and described in detail herein, it will be apparent to those skilled in the relevant art that various modifications, additions, substitutions, and the like can be made without departing from the spirit of the invention and these are therefore considered to be within the scope of the  
15 invention as defined in the following claims.